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Docket No.: VRT0117US

November 5, 2004

Commissioner For Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Re: Applicant(s): Dilip M. Ranade
Assignee: VERITAS Operating Corporation
Title: Coordinated Dirty Block Tracking
Serial No.: 10/747,782
Examiner: Unassigned
Docket No.: VRT0113US
Filed: December 29, 2003
Group Art Unit: 2632

Dear Sir:

Transmitted herewith are the following documents in the above-identified application:

- (1) Return Receipt Postcard;
- (2) This Transmittal Letter (1 page) (*in duplicate*);
- (3) Petition to Make Special Under 37 CFR §1.102(d) (7 pages);
- (4) Copies of 3 references for accompanying Petition;
- (5) Preliminary Amendment (11 pages);
- (6) Information Disclosure Statement Under 37 CFR §1.97(b) (1 page); and
- (7) PTO 1449 (citing 13 references) (1 page).

☒ The fee has been calculated as shown below:

CLAIMS AS AMENDED

	Claims Remaining <u>After Amendment</u>		Highest No. Previously <u>Paid For</u>		Present <u>Extra</u>		Rate		Additional <u>Fee</u>	
Total Claims	47	Minus	31	=	16	x	\$ 18.00	\$	288.00	
Independent Claims	4	Minus	4	=	0	x	\$ 88.00	\$	0.00	
<input type="checkbox"/>	Fee of _____ for the first filing of one or more multiple dependent claims per application								\$	
<u>Total additional fee for this Amendment:</u>								\$	<u>288.00</u>	
<input checked="" type="checkbox"/>	Fee Under 37 CFR § 1.17(h) for Filing A Petition to Make Special									<u>130.00</u>
<input checked="" type="checkbox"/>	Conditional Petition for Extension of Time: If an extension of time is required for timely filing of the enclosed document(s) after all papers filed with this transmittal have been considered, an extension of time is hereby requested.									
<input checked="" type="checkbox"/>	Please charge our Deposit Account No. 502306 in the amount of								\$	<u>418.00</u>
<input checked="" type="checkbox"/>	Also, charge any additional fees required and credit any overpayment to our Deposit Account No. 502306.									
Total:								\$	418.00	

EXPRESS MAIL NUMBER:

EV 304740310 US

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Dilip M. Ranade
Assignee: VERITAS Operating Corporation
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PETITION TO MAKE SPECIAL UNDER 37 CFR §1.102(d)

Dear Sir:

The applicants hereby petition pursuant to 37 CFR §1.102(d) and MPEP § 708.02(VIII) to make the above-identified application special. Please charge Deposit Account No. 502306 the fee of \$130.00 for this petition as set forth in 37 CFR §1.17(h).

Should the Office determine that all the claims contained in the accompanying preliminary amendment are not obviously directed to a single invention, the applicants will make an election without traverse as a prerequisite to the grant of special status.

The applicants respectfully submit that a pre-examination search has been performed by a professional search firm in the following classes/subclasses:

<u>Class</u>	<u>Subclasses</u>
707	202
714	6, 16, 17

Enclosed is a preliminary amendment which requests to amend claims 1-12, 14-24, and 26-31 and add claims 32-47. The references have been evaluated herein in light of the claims as amended therein.

11/10/2004 BABRAHA1 00000036 502306 10747782

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Enclosed are copies of the following references which are presently believed to be, from among those made of record in the accompanying Information Disclosure Statement and any previously filed Information Disclosure Statement, the most closely related to the subject matter encompassed by the claims as amended in the accompanying preliminary amendment:

U.S. Patent No. 6,052,797

U.S. Patent No. 6,658,590 B1

U.S. Patent Application Publication No. US 2004/0010499 A1

Detailed Discussion of the References

U.S. Patent 6,052,797 (Ofek) discloses a remotely mirrored data storage system with a count indicative of data consistency. Two data storage systems are interconnected by a data link for remote mirroring of data. (See Fig. 1). A pair of volumes, one primary and one remote, is configured as a remotely mirrored volume pair. (See Abstract). In one embodiment, each write request to the primary is transmitted over the link between the data storage systems. (See column 2, lines 40-46). The secondary data storage system may provide an indication or acknowledgement of receipt or completed write operation to the primary data storage system. (See column 3, lines 1-8). In one embodiment, the write request includes the data for at least one track in the secondary volume to be updated and the current “invalid tracks count” for the secondary volume as computed by the data storage system containing the corresponding primary volume. (See column 22, lines 58-67). The “invalid tracks count” can be used to determine a recovery operation for the volume in the event of a “rolling disaster.” (See column 23, lines 1-4). A rolling disaster occurs when a communication link between the primary and secondary nodes fails, data continue to be written to the primary volume, resynchronization begins, and then the primary volume fails before resynchronization is complete. (See column 22, lines 29-57). A rolling disaster therefore renders both the primary and secondary volumes unusable.

Ofek does not teach “causing an entry to be added to a list of entries for the first location, wherein each entry in the list is related to an update to data in the first location, and the list can be used to reset the indicator for the first location,” as required by independent claim 1 (as amended by the accompanying preliminary amendment) and substantially required by amended independent claims 14, 19, and 26. No information related to multiple updates to a given location appears to be maintained. For example, Ofek explicitly indicates that no log of every single write to the primary volume is maintained (see column 22, lines 44-45); instead, only the data for the most recent write to each track is maintained in the primary volume, together with a “record” of the particular “invalid tracks” that need to be written to the secondary volumes to achieve synchronization. (See column 22, lines 44-50). Accordingly, independent claims 1, 14,

19, and 26, and respective dependent claims 2-13 and 32-35, 15-18 and 36-39, 20-25 and 40-43, and 27-32 and 44-47 are allowable over Ofek for at least this reason.

U.S. Patent No. 6,658,590 B1 (Sicola) teaches a controller-based transaction logging system for data recovery in a storage area network. A completely redundant configuration is used in a transaction logging system, including dual fibre channel fabric links interconnecting with each of the components of two data storage sites. (See column 3, lines 33-37). Each site includes a host computer and associated data storage array, with redundant array controllers and adapters. (See column 3, lines 37-40). Each array controller is capable of performing all of the data replication functions, and each host 'sees' remote data as if it were local. (See column 3, lines 40-43).

A volume on a local array is paired with a volume on a remote array as a 'remote copy set.' (See column 6, lines 51-54). Each write command to the local controller is also sent to the remote controller via the arrays' built-in replication function. (See column 11, line 61 through column 12, line 44). Data are written into a write-back cache on the local node. Other information is written to a micro-log, such as the write transfer LBN extent, command, command sequence number, and context information. (See column 11, line 67 through column 12, line 6; see also column 13, lines 8-10). A micro-merge operation can be performed when a controller fails after indicating to the host that a write was completed, but before the remote copy operation completes. (See column 12, lines 45-50). Data can be read from the micro-log and write commands re-issued on the remote controller to synchronize the data on the local and remote controllers. (See column 12, lines 45-59).

Sicola does not teach "causing an entry to be added to a list of entries for the first location, wherein each entry in the list is related to an update to data in the first location, and the list can be used to reset the indicator for the first location," as required by independent claim 1 (as amended by the accompanying preliminary amendment) and substantially required by amended independent claims 14, 19, and 26. No information related to multiple updates to a given location appears to be maintained. As noted above, the replication function is built into the storage arrays, and indicators and lists of entries

- related to updates of storage locations are not tracked by the software. Accordingly, independent claims 1, 14, 19, and 26, and respective dependent claims 2-13 and 32-35, 15-18 and 36-39, 20-25 and 40-43, and 27-32 and 44-47 are allowable over Sicola for at least this reason.

U.S. Patent Application Publication No. US 2004/0010499 A1 (Ghosh) teaches a database system with improved methods for asynchronous logging of transactions. Log records are created describing changes to the database for a given transaction. (See paragraph 24). When a command which commits changes to the database is received, a request to store log records for the transaction is automatically placed in a request queue. (Id.). Requests are removed from the request queue in sequence and log records associated with the request are transferred to a shared cache. (Id.) The shared cache contains log pages for storing log records from multiple transactions before such log records are written to the transaction log. (Id.) After log records for a transaction are transferred to log pages in the shared cache, the log pages are written from the shared cache to the transaction log. (Id.) After all log pages in the shared cache for a given transaction have been written to the transaction log, changes to the database made by the transaction can be committed to the database. (Id.)

In one embodiment, a log writer continuously monitors the shared log cache and writes log pages to disk when it finds dirty log pages or buffers (i.e., log pages not yet written to disk) in the shared log cache. (See paragraph 114). The log writer also tracks the sequence number of the first dirty log page (i.e., the first page in the sequence that has not been written to disk.) (See paragraph 115). Using this sequence number, the log writer can identify when another task should be activated. (Id.) The log writer compares the sequence number of the last log page (i.e., the log page containing the commit statement for the task) of task(s) in queue to the sequence number of the first dirty log page to determine if all log pages of such task(s) have been written to disk. (Id.) If so, the log writer starts such a task, as logging operations are complete and the transaction may either commit or abort. (Id.)

While not involving data replication from one site to another, Ghosh teaches writing log data from one location to another and the need to ensure that the data in the shared cache and transaction log on disk are synchronized before continuing to flush additional data to disk. However, Ghosh does not teach “causing an indicator to be set for a first location, wherein ... the indicator indicates that the first data are unsynchronized with corresponding data in a corresponding location of the secondary storage area,” as required by amended independent claim 1 and substantially required by amended independent claims 14, 19, and 26. Nor does Ghosh teach “causing an entry to be added to a list of entries for the first location, wherein each entry in the list is related to an update to data in the first location, and the list can be used to reset the indicator for the first location,” also required by the independent claims. Therefore, independent claims 1, 14, 19, and 26, and respective dependent claims 2-13 and 32-35, 15-18 and 36-39, 20-25 and 40-43, and 27-32 and 44-47 are allowable over Ghosh for at least this reason.

CONCLUSION

- Applicants respectfully request that this petition be granted, and that the present application receive expedited examination. Should any issues remain that might be subject to resolution through a telephonic interview, the Office is requested to telephone the undersigned.

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Respectfully submitted,



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